

Application No.: 10/519655
Docket No.: AD6899USPCT

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Amendments to Specification

(A) Please amend the first two paragraphs on page 2 of the application as follows:

Processes for making laminated decorative glass have been disclosed in WO 217154A1 ~~02/18154A1~~, DE 29706880, US 4968553, US 5914178, EP 1129844A1, and DE 20100717. These decorative laminates use PVB, PVB/PET/PVB composites, or EVA (ethylene/vinyl acetate copolymers) as the interlayer. While the resulting decorative safety glass laminates may meet the architectural safety codes, these laminates may not perform well in demanding applications such as those outlined above.

Further many of these references disclose a process for making decorative laminated glass via a silk screening process (DE 29706880, US 4968553, US 5914178, EP 1129844A1, and DE 20100717). Silk-screening an image onto an interlayer is a very time-consuming and expensive process for making decorative laminated safety glass. Ink jet technology is very flexible; any digital image can be printed onto the substrate. Using ink jet technology to print on flexible interlayers (PVB and polyurethanes) for laminated safety glass has been disclosed in WO 0218154. Several disadvantages of ink jet printing directly on PVB include the fact that all PVB interlayers have a roughened surface pattern (R_z from 30-60 ~~mm~~ μm), which is present to allow for air to escape during the lamination process as described in US 5455103. The rough surface pattern can effect image quality with respect to mottle and resolution. Also, polyvinyl butyral is a viscoelastic polymer, which can lead to poor dimensional stability in the image-bearing interlayer.

(B) Please amend the Summary of the Invention at page 3 of the application as follows:

In one aspect, the present invention is a process for ink-jet printing an image onto a rigid thermoplastic interlayer comprising the step: feeding a rigid interlayer sheet through an ink jet printer and ink-jet printing an image on the

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sheet, wherein the interlayer has a Storage Young's Modulus of 50-1,000 MPa (mega Pascals) at 0.3 Hz and 25°C, as determined according to ASTM D 5026-95a, and wherein the rigid interlayer sheet has a finite thickness of less than or equal to about 0.38 mm. Preferably the interlayer is either an ethylene/(meth)acrylic acid copolymer ionomer or PVB comprising plasticizer in an amount of less than 30 parts per hundred parts based on the weight of the interlayer sheet. More preferably the interlayer is an ethylene/(meth)acrylic acid copolymer ionomer.

In a preferred embodiment, the process further comprises the step of laminating the image-bearing interlayer sheet with a second interlayer sheet which is non-image bearing, to form a composite image-bearing interlayer, wherein the total thickness of the composite interlayer is in the range of from about 0.40 mm to about 2.29. Preferably the image-bearing surface of the rigid interlayer is the surface that is in contact with the surface of the second interlayer sheet. Preferably the second interlayer sheet is an ethylene/(meth)acrylic acid copolymer ionomer. Preferably the second interlayer sheet has a thickness of from about 0.76 mm to about 1.13 mm.

In another aspect, the present invention is thermoplastic interlayer sheet bearing an image on at least one surface of the interlayer sheet, the image being printed on the sheet by a process comprising the step: feeding a rigid interlayer sheet through an ink jet printer and ink-jet printing an image on the sheet, wherein the interlayer has a Storage Young's Modulus of 50-1,000 MPa (mega Pascals) at 0.3 Hz and 25°C, as determined according to ASTM D 5026-95a, and wherein the rigid interlayer sheet has a finite thickness of less than or equal to about 0.38 mm. Preferably the interlayer has a surface roughness of from about 5 μ m to about 15 μ m. Preferably the size of the image does not change by more than +1% of the initial size of the image after drying at 60°C for 30 minutes after the image is printed.

In still another aspect, the present invention is a decorative glass laminate comprising at least two sheets of glass having disposed therebetween a rigid image-bearing interlayer sheet wherein the image bearing interlayer was obtained by a process comprising the steps of: (1) "ink jet" printing pigmented ink onto at least one surface of an interlayer sheet which is a rigid

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ethylene/methacrylic acid copolymer ionomer having a thickness of less than or equal to about 0.38 mm and wherein the interlayer has a Storage Young's Modulus of 50-1,000 MPa (mega Pascals) at 0.3 Hz and 25°C, as determined according to ASTM D 5026-95a, to obtain an image-bearing interlayer sheet; and (2) laminating the image-bearing interlayer sheet between sheets of transparent materials to obtain a decorative laminate. Preferably the rigid interlayer comprises a roughened surface having a roughness (R_z) of from about 5 μm to about 15 μm prior to lamination.

Preferably the rigid image-bearing interlayer is laminated with one or more other interlayer sheets to yield a composite interlayer having a total thickness of from about 0.40 mm to about 2.29 mm. Preferably the other interlayer comprises a thermoplastic polymer selected from polymers in the group consisting of: PVB; PET; PUR; PC; PVC; of ethylene/(meth)acrylic acid copolymer ionomers; ethylene/(meth)acrylic acid/alkyl acrylates terpolymers.

In a preferred embodiment, the image is printed using a drop on demand (DOD) ink jet printing process. In one preferred embodiment, the DOD process is a piezo electric process. In another preferred embodiment, the DOD process is a thermal ink jet printing process.

In another preferred embodiment, the image is printed using a continuous drop ink jet printing process.

The invention is also directed to a decorative laminate obtained by the process. Preferably the image-bearing interlayer is laminated with at least one additional sheet of at least one other interlayer to produce a composite image-bearing interlayer, wherein the at least one additional interlayer sheet has a thickness sufficient to such that the total thickness of the composite interlayer falls within a range of from about 0.40 mm to about 2.29 mm, and wherein the composite image-bearing interlayer is further laminated with at least one sheet of glass.